

Winter 2012

Volume 25 - No 1

ISSN 1042-198X

USPS 003-353

SINGLE ISSUE

\$6.00 USA

\$7.00 CANADA

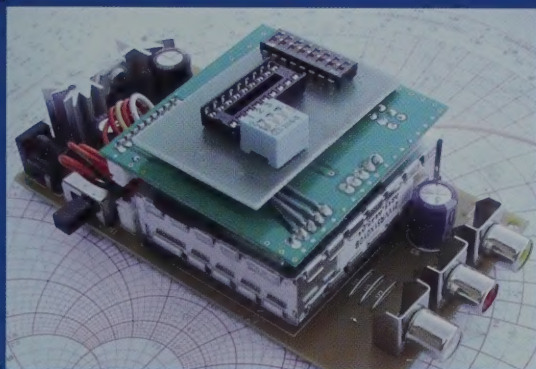
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Early Television Museum

Dayton Hamvention ATV

PIC Frequency Control



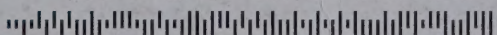
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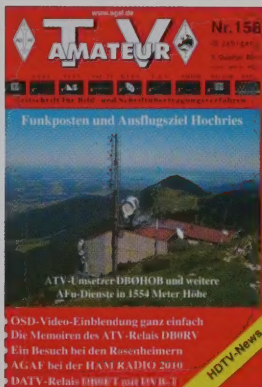
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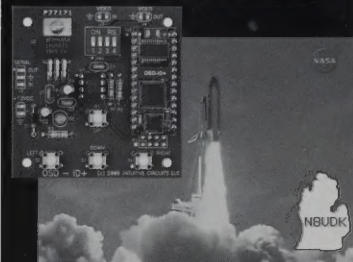
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Published by
ATV Quarterly

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Amateur Television Quarterly (ISSN 1042-198X) is published quarterly, in January, April, July, and October for \$22.00 per year by ATV Quarterly Magazine, P.O. Box 1594, Crestline, California 92325. Periodicals Postage Paid at Crestline, CA and additional mailing offices. POSTMASTER:

Send address changes to:

Amateur Television Quarterly,
P.O. Box 1594, Crestline, CA 92325.

Amateur Television Quarterly is available by subscription for \$22.00/yr in the USA; \$25.00/yr in Canada; \$32.00/yr elsewhere. Single issues \$6.00/USA; \$7.00/Canada; \$9.00 elsewhere.

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Sync Buzz Editorial

- Bill Brown WB8ELK and Mike Collis WA6SVT



1000 feet above the Hamvention taken with a GoProHeroHD camera onboard a weather balloon launched from the flea market

Dayton Hamvention ATV

Lots of great ATV activities will be featured this year at the 2012 Dayton Hamvention.

There will be a BalloonSat launched from the flea market on Friday afternoon right after the BalloonSat Forum. The photo above was taken by a camera onboard last year's flight. This year we plan to include a live SSTV downlink on two meters.

All are invited to attend the annual ATV Dinner on Friday evening at Roush's restaurant. Last year we had over 50 ATVers in attendance. Check out P. 24 for a map.

On Saturday, ATV Forum chairman Art Towslee WA8RMC promises a fine lineup of presenters at this must-see annual event. See page 25 for details.

ATN will have a inside booth and we plan to hang out there so feel free to drop by and visit. We look forward to seeing everyone.

Stay Tuned,

- Bill and Mike

ATVQ

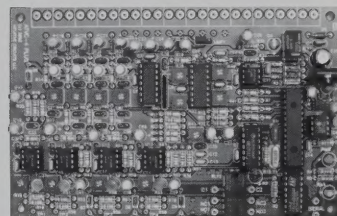
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Right after the Dayton Hamvention experience last year, a group of us decided to see if we could visit the Early Television Museum in Hillard, Ohio near Columbus. We were granted a private tour of the facilities with very satisfying results. We spent about two hours there but easily could have spent more if time permitted. He has, I believe, the most complete and comprehensive collection of old TV's from around the world ever assembled. Most of the sets are fully operational which is truly amazing. I recommend it as a perfect ending to the Dayton weekend. If you're at Dayton next year, put this museum on your schedule if you can as it's only a 1 hour drive from there. You'll not regret it! There is not enough space here to describe each picture but I'm sure you will recognize some of them!

When you are at the Dayton Hamvention this year, it is just a short drive East (about 1 hour) to the museum. If you're interested in the tour, let us know at the Hamvention Friday night dinner so we can arrange to have Steve open the museum for us. He's there most weekends but reservations are best to avoid a wasted trip. Or, you can contact Steve direct at 614-771-0510. Early Television Foundation, 5396 Franklin Street, Hilliard, OH 43026. earlytelevision.org

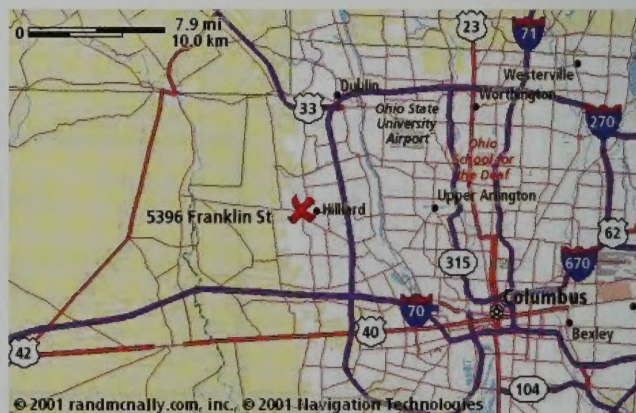
From I-270, take exit 13B, Cemetery Road (west toward Hilliard. On Cemetery Road you will go under two railroad underpasses. After the second one, turn right (north) on Main Street. At Franklin Street (3 blocks) turn left (west). The museum is one block on the right. See map on the right....WA8RMC

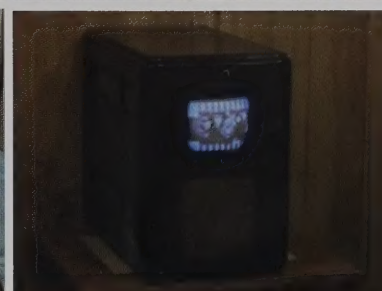
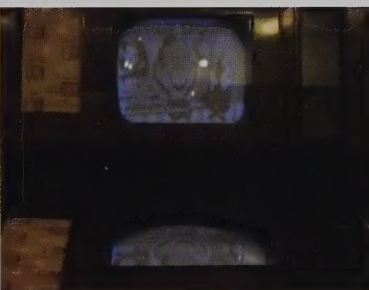
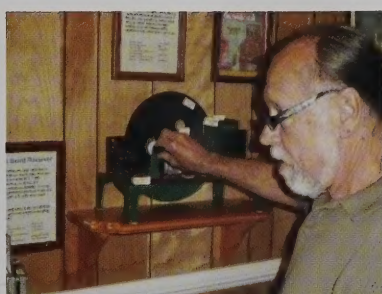



Here are some of the group that attended last year.



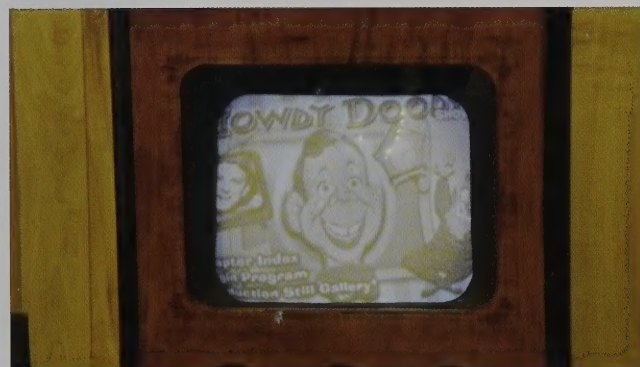
Left to right is Mike, WA6SVT, Steve McVoy, President of the museum and myself waiting to receive the tour.





Cont. on Page 8 





DAYTON HAMVENTION FRIDAY NIGHT DINNER DETAILS

Well, here we are again at the Dayton Hamvention Friday Night ATV dinner. It's always kind of special to enjoy a good sit down dinner with Ham friends of similar interests to discuss the Hamvention adventures that day. We just sit down, relax, rest our feet and enjoy the moment.

The drive to Roush's Restaurant in Fairborn, Ohio (near the end of the Wright Patterson Air Force base north runway) is about a 10 mile drive from Hara Arena but easy to find. Once there, we can immediately order food independently so we can both eat and partake in the discussions about the day's bargains!

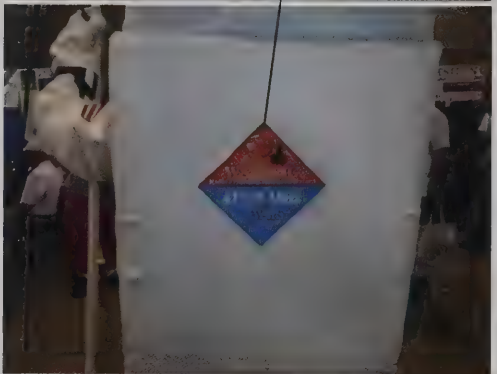
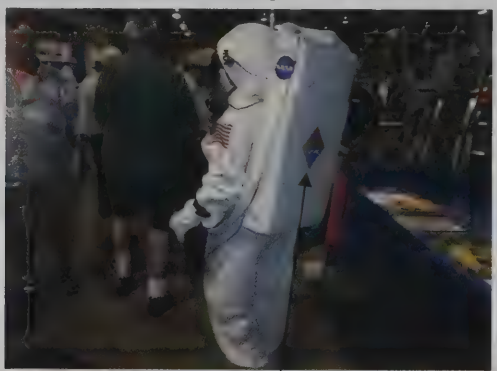
We had about 50 participants this year up from about 35 the year before. The formal discussions and presentations were moderated by Ron Coen, K3ZKO who guided us through them and handed out some door prizes. The pictures below are a sample of the good time had by all.

Please try to reserve time in your next years Dayton schedule to attend and enjoy these festivities. You won't regret it. We already have the same restaurant reserved. For those Columbus, Ohio Hamvention attendees, remember, it's located on the way home so you won't be going out of your way!



DAYTON HAMVENTION "ASTRONAUT"

While walking around Dayton this year, I happened upon a person in an astronaut suit with an ATV transmitter and I couldn't resist the urge to stop and question him about his unusual attire. He obliged and was even willing to promote the ATVQ Magazine by holding up a copy. He is Russ Hummel W4PGT, Quinton, VA rshummel1@cox.net. The suit has a 427.25 MHz Videolynx transmitter with a 1/4 wave Halo antenna. Included is an Intuitive Circuits overlay with oxygen saturation sensor, CO₂ sensor, heart rate, respiration rate, plus five temperatures for both equipment and environment. It is a real NASA Apollo suit used for ground training.



Russ holds up a copy of ATVQ Magazine on the left.

To the right Mike, WA6SVT, signs him up for an ATVQ subscription.

Below they both "celebrate" a successful transaction.



TechTalk95

The VK3RTV World-Wide DATV QSO Party

by Ken Konechy W6HHC

Orange County Amateur Radio Club – www.W6ZE.org

In celebration of the 100 Years of Amateur Radio Victoria providing support for ham radio, organizer Peter Cossins VK3BFG and the hams associated with the VK3RTV digital-ATV repeater conducted the first world-wide DATV QSO Party on August 26-27 (UTC). The VK3RTV repeater is the first in Australia with a two channel multiplexed 100%-digital-transmitting output. In eastern Australia, many hams had contact directly line-of-sight by radio frequencies with the VK3RTV DATV-repeater (near Melbourne). In other parts of Australia, and Thailand, and United States, hams relayed their video to Peter VK3BFG by SKYPE video-connections...who then uplinked the video and audio to the VK3RTV digital repeater using the DVB-S protocol for DATV.

Getting a 1.2 GHz DATV Signal to Australia

The W6HHC digital-ATV signal was transmitted on 1.2 GHz using DVB-S protocol for DATV. The signal was then received on a nearby satellite-SetTopBox receiver that sent the video signal over by USB to a Dell notebook computer to be displayed. See **Fig 1** of the W6HHC DATV video being received in Orange, CA.

The next step was to take the video display on the notebook computer and send it over the internet by SKYPE video-connection (called "shared-display" or "shared-desktop") to Peter VK3BFG, the net control station for the DATV QSO Party. See **Fig 2** for a block diagram explaining the video signal path. Peter

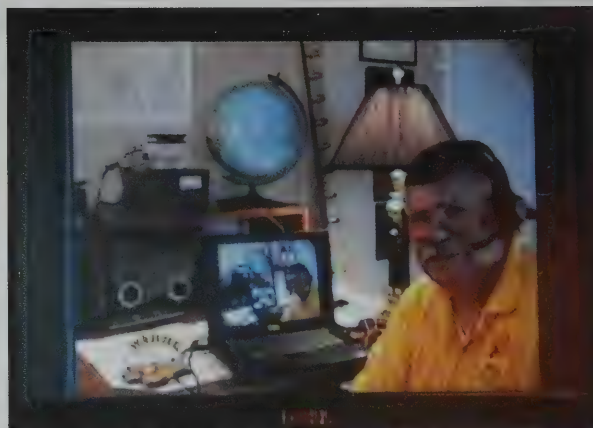


Figure 1 – W6HHC 1.2 GHz DATV Video being Received on SetTopBox/Notebook-Computer

VK3BFG then uplinked the received SKYPE video to the VK3RTV DATV repeater on 1.2 GHz using DVB-S protocol. The VK3RTV repeater in turn downlinked W6HHC video on 446.5 MHz using the DVB-T protocol.

As shown in **Fig 2**, a 5.8 GHz link direct from the VK3RTV repeater site to an internet gateway sends the video over internet as streaming video to the BATC (British Amateur Television Club) server. Now the VK3RTV video could be seen all over the world through the www.BATC.TV/ internet URL. It was exciting to watch my DATV video come back from the VK3RTV digital-repeater via the BATC streaming server on the internet. This was an interesting combination of ham radio and internet!

Getting my DATV Signal to Australia via W6ATN

Amateur Television Network (ATN) links several ATV repeaters in California-Arizona-NV-NM including W6ATN located on Saddleback Peak in Orange County.

Figure 2 – Block Diagram Showing W6HHC DATV QSO Straight to Australia

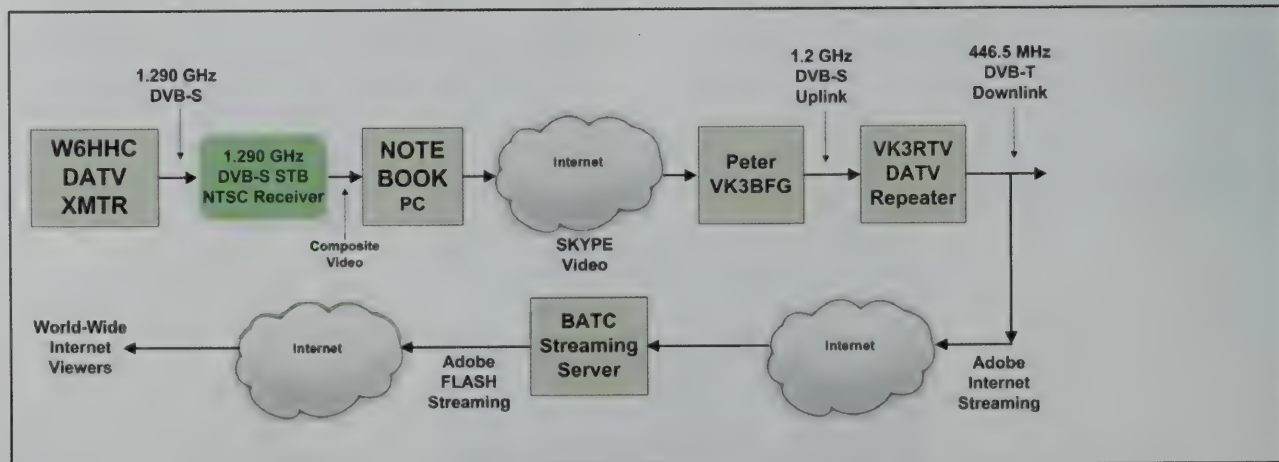
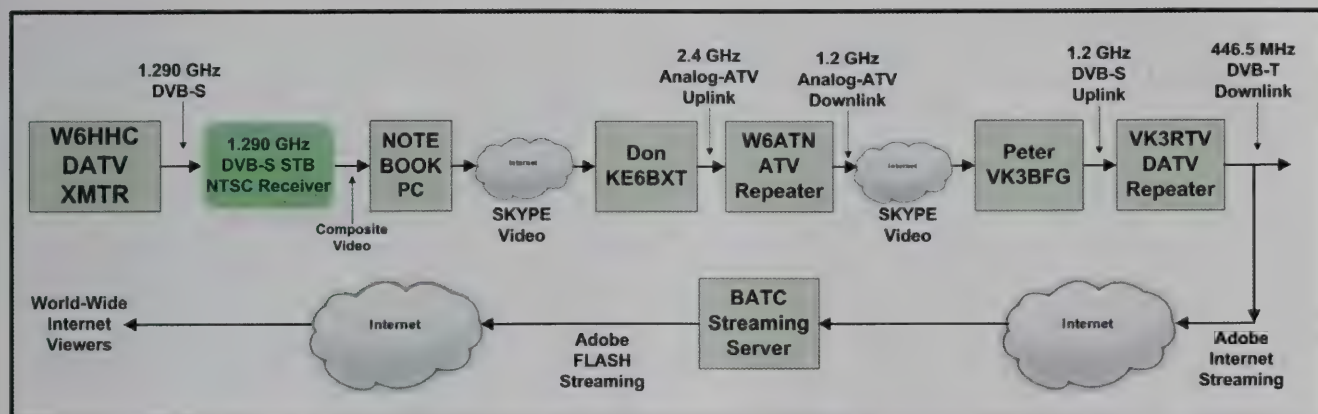


Figure 3 – Block Diagram Showing W6HHC DATV QSO to Australia via W6ATN



Don KE6BXT in Mission Viejo worked very closely with Peter VK3BFG while planning for the DATV QSO Party to allow ATV hams in the US to uplink to W6ATN and then send the W6ATN repeater video to be sent to VK3BFG over the internet using SKYPE video-connection. Don KE6BXT also allowed me to SKYPE my DATV video directly to him. KE6BXT then uplinked my signal to W6ATN on 2.4 GHz and then SKYPE'd the 1.2 GHz ATV downlink to VK3BFG via a separate SKYPE video-connection. **Fig 3** has video path details.



Fig 4 – Typical VK3RTV Repeater Test Pattern seen over the Internet

Summary

The VK3RTV world-wide DATV QSO Party was a success! Peter VK3BFG reported that he logged a total of 65 QSO's during the DATV QSO Party event, including three VK3 portable DATV stations operating in the field for the event.

Interesting DATV Links

- VK3RTV Digital Repeater WEB site – see www.VK3RTV.com
- W6ATN Amateur Television Network (ATN) – see ATN-TV.org/
- Amateur Radio Victoria organization – see www.AmateurRadio.com.au/
- British ATV Club - Digital Forum – see www.BATC.org.UK/forum/
- British ATV Club – select from about 25 streaming repeaters – see www.BATC.TV/
- German ATV portal for streaming repeaters and forum – see www.D-ATV.net/
- Orange County ARC newsletter entire series of DATV articles – see www.W6ZE.org/DATV/
- Yahoo Group for Digital ATV - see groups.yahoo.com/group/DigitalATV/

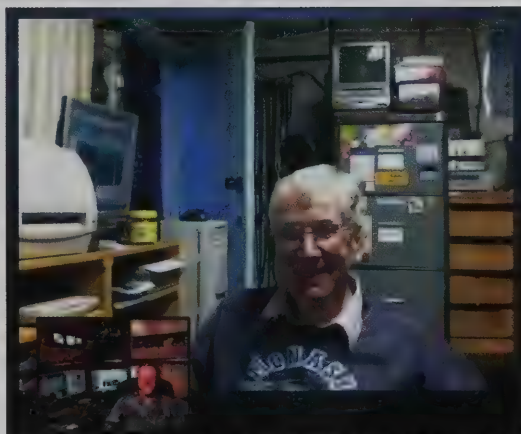
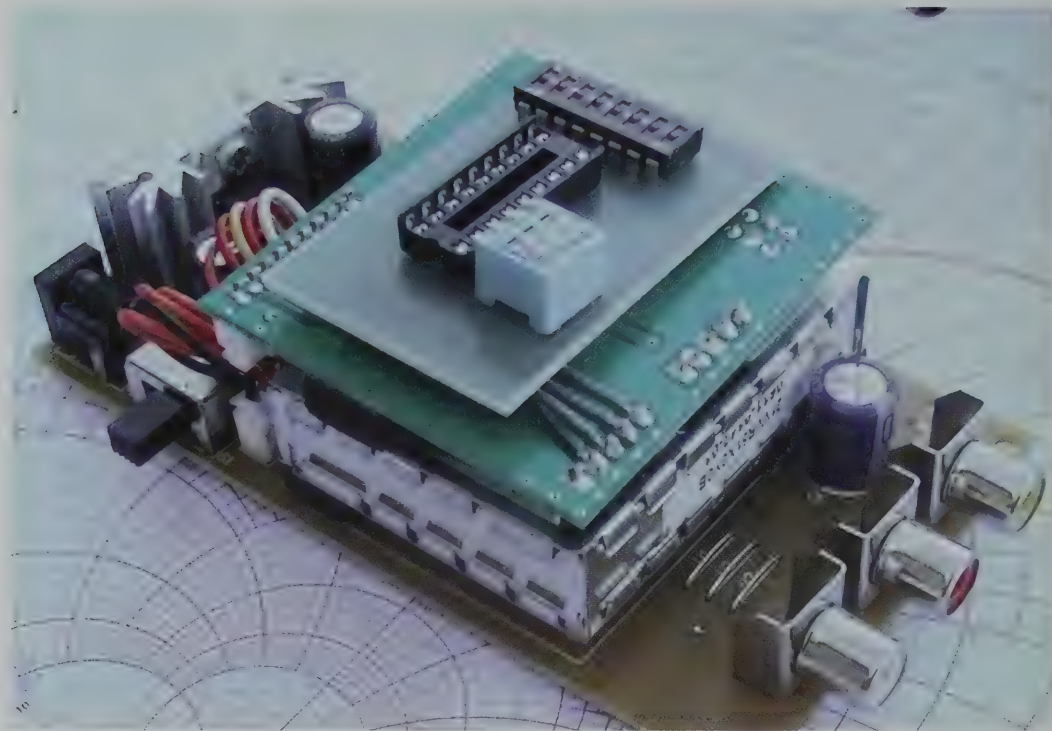


Figure 5 – The Larger Picture is Peter VK3BFG testing with Don KE6BXT (smaller PIX in lower corner) (photo courtesy of KE6BXT)

Don KE6BXT reported that 16 different US hams checked into (by RF or by SKYPE-video) the VK3RTV DATV QSO Party via ATN. As said earlier, I thought this QSO Party was really an interesting and exciting inter-mixing of digital-ATV, analog-ATV and internet. My only disappointment was that I could not watch the BATC streaming video on my iPad. This small compatibility glitch was caused by Apple refusing to support FLASH-video on the iPad or iPhone. I want to thank Don KE6BXT for helping me sort out a dozen SKYPE issues before the QSO Party and Peter VK3BFG who took the time to test with Don and me using SKYPE before the QSO Party. The DATV QSO Party was great fun!! I got to meet (see) a lot of DATV hams. I think this event was great promotion of DATV!!

“Video Senders” Frequency Control with a PIC Chip Add-on

Bob Miller W6KGE



PIC add-on DIP board on a 5.8 GHz ‘sender’ transmitter.

Hams often use converted ‘video senders’ as an inexpensive way to ‘get on’ amateur TV.

Additionally the ‘senders’ can be used for linking ATV repeaters, or for a test bench signal source for the microwave bands. ‘Video senders’ or just the word ‘senders’ generally means both a transmitter and receiver that are sold together; they work as a pair.

Units such as the Wavecom Jr , Wavecom Sr and Wavecom Pro, Radio Shack, and units made with modules from ComTech such as those sold by Harlan Technology have all been used. Many of the ‘senders’ are no longer manufactured, but are available at “on-line” places like eBay and at electronic swap-meets. Units that originally sold for around one hundred dollars often sell for less than twenty dollars today.

Transmitters come ready to connect to video directly from a camera or other video source and both ‘right’ and ‘left’ audio inputs. The receivers are ready to connect to a TV set’s video and audio inputs. Video and audio can be sent for distances up to a couple of hundred feet. TV amateurs add amplifiers and external antennas to increase the range to fifty or more miles! Many articles in *Amateur Television Quarterly* and on the web have detailed improvements to these inexpensive units.

The types of ‘senders’ that will work for amateur television, such as those listed above, use a crystal controlled PLL frequency synthesizer. (Some other ‘senders’ are not crystal controlled and are too unstable for use with higher power on the amateur bands.)



Viewing clockwise, a Wavecom Pro 2.4 GHz 'sender' transmitter with a LCD version PIC add-on, frequency control, installed. A DIP switch version of the PIC add-on. A LCD version PIC add-on, before installation.

The 'senders' that can be used for amateur television have one important device in common – a SP5055 or SP5769 type, I2C bus controlled PLL frequency synthesizer. The SP5055 is typically used for the 2.4 GHz and lower frequency 'senders'. The SP5769 is generally used for the 5.8 GHz 'senders'.

The 'senders' have one major limitation. Unfortunately, the frequencies that you can choose using the 'factory settings' are limited to one or two that are in the Ham Band. To make things worse, the frequencies are generally not those used by TV amateurs. The PIC controller chip in these units is a 'one time programmable' type. While it might be possible

for some of us to unsolder and replace the PIC with a new PIC with a program for a specific frequency, the risk of permanently destroying the pc board in the process is very high. You would still be limited to a small number of frequencies.

By using an "Add-on" PIC you can add hundreds of frequencies and limit the possibility of destroying the pc board. The PIC add-on units that I'll be describing in this article are:

1. Usable for most of the various 'senders'... both transmitters and receivers on all of the various ham bands.
2. Simple, and inexpensive.

Continued on Page 16



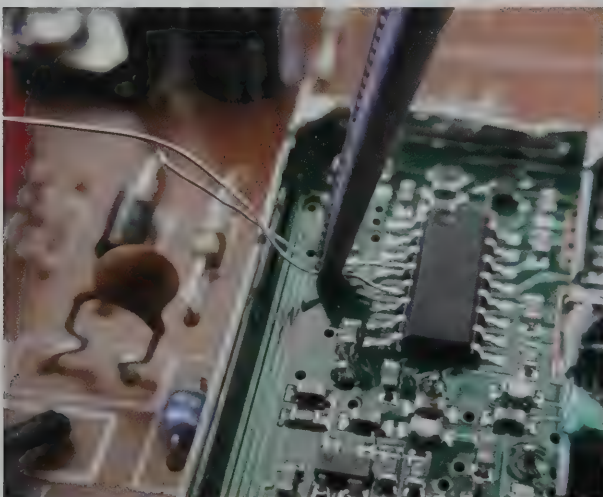
3. Able to tune to a large number of specific frequencies.
4. Relatively easy to install.

I'm using a Wavecom Pro receiver on 2.4 GHz with a SP5055 as a specific example for this article. Most other 'senders' (transmitters and receivers) with SP5055 or SP5769 series chips can be used with the PIC chip add-on conversion. This includes 'senders' (Transmitters and Receivers) in the 900 MHz, 1.2 GHz, 2.4, GHz, 3.4 GHz and 5.8 GHz bands.

The SP5055 or SP5769 gets frequency control instructions from a Programmable Interface Controller, or PIC, via a I2C bus. The I2C bus uses three wires; Clock, Data, and Ground. Both the SP5055 and the SP5769 series PLL's use the same IC pins for the data and the clock lines. So references that I make to the SP5055 can also be assumed for the SP5769 series.

The PIC that is existing in the 'sender' needs to be "disconnected" from the SP5055 pins 4 and 5. The PIC that you will be adding for the conversion needs to be connected to the SP5055 with two wires. Keep these wires as short as possible, but no longer than about five inches. These are the Data (SDA) pin 4 on the SP5055; and Clock (SCL) pin 5 on the SP5055. Two additional wires are used to connect to ground and to regulated +5 volts. That's all there is to it!

I've designed two types of PIC add-on frequency control boards. The first type uses DIP switches and



a frequency selection chart to set frequencies. This is the simplest and least expensive option, and is typically used for a transmitter or receiver set for a specific single frequency, and is seldom, if ever, re-tuned. The second type uses a liquid crystal display to read out the frequency that is selected with push buttons. It can retain a selected frequency in memory. This option is used for quickly selecting different frequencies without having to refer to a frequency selection chart. The DIP switch and the LCD versions are available in various configurations. (Even custom programmed to your requirements.) For example, one is designed for a choice of 256 different frequencies, or 'steps'. The most "popular" one is programmed with 128 'steps', for tuning from 2390.0 to 2453.5 in 0.5 MHz steps. Seven of the DIP switches are used to select the frequency, and the eighth switch is used to select "transmitter" or "receiver". In the "receiver" mode, the actual frequency is shifted to that of the local oscillator. The second includes a LCD digital frequency read-out that is easily tuned with "frequency up" and "frequency down" push buttons, and includes a push button to store a selected frequency in eeprom memory. The frequency in memory is the first frequency displayed when the unit is powered down, then back up. When using either the DIP or the LCD version, both boards connect to the 'sender' with just four wires. (Data, Clock, +5 volts, and ground.) For this article, I've included details showing the four wire connections for the DIP switch version, but the LCD version connects in exactly the same way.

I offer kits for both the DIP version and the LCD versions. The kits will include an assembled and tested board; a pre-programmed PIC controller chip; the wire-wrap wire; and a Zener diode and various resistors for use in 'senders' that do not have a +5 volt regulator; a frequency selection chart for the DIP switch version; and more detailed instructions. (2)

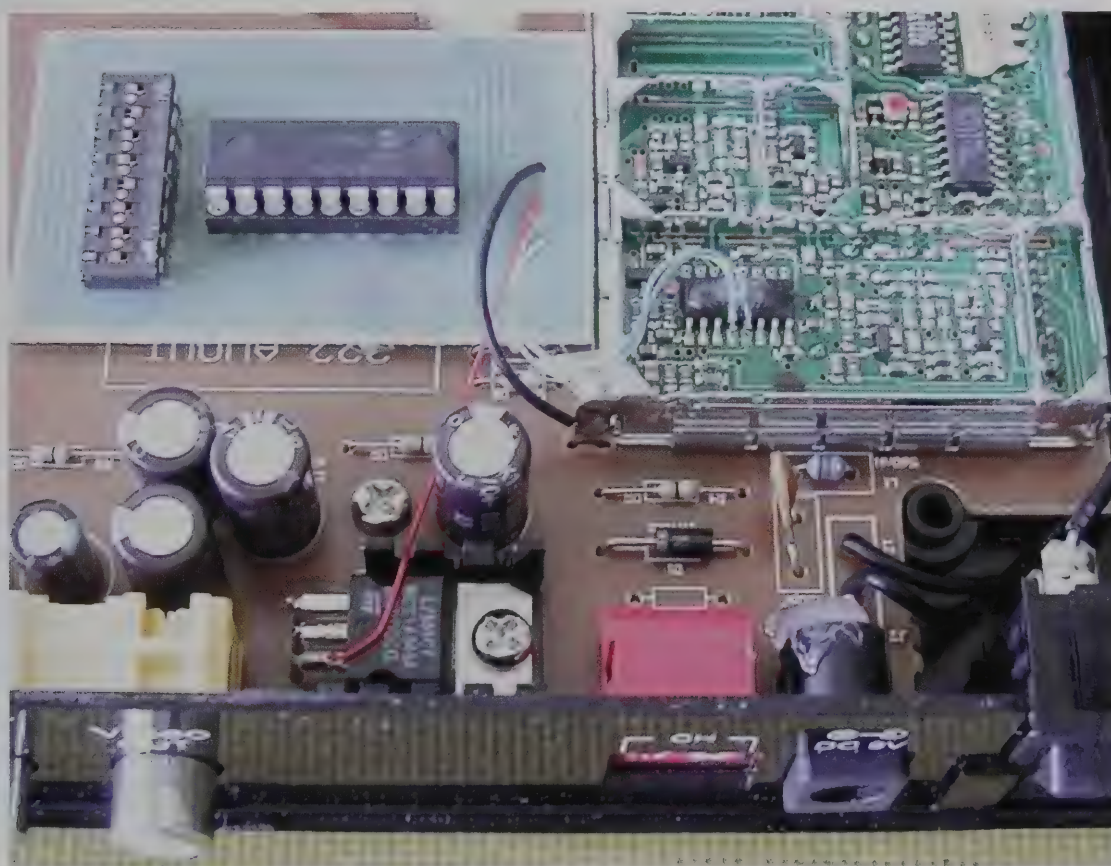
Start your conversion by making sure that the unit works before you start! Next, take the case apart by finding the screws that are usually hidden under the little foot pads or labels on the bottom. At this point you might notice that many of the units contain additional parts that you might want to remove and save. For example, the Wavecom Sr and Wavecom Pro

'senders' usually include a 433 MHz transmitter or receiver to convert and send InfraRed remote control signals, wirelessly, from room to room. The circuits are fairly straight forward. (Of course, you can leave them in place if you are in a hurry.) If you do remove them, check again to make sure things still work.

Since there are so many different models of 'senders', you'll first have to find the SP5055 chip. The chip is located somewhere in the metal shielded RF section. The SP5055 is marked "SP5055". Next, look for the PIC chip. The PIC chip is usually a 18 pin SOIC. If you don't find the PIC, because it's on the bottom of the board, inside the shielded RF enclosure, with bunches of solder connections to the 'mother board'.... Or for whatever reason.... that's ok. It is

easier if you have access to the PIC. However, if the PIC is in a spot that is hard to access, you can use another method to make the conversion. (Again, all you need to do is cut the existing circuit from pins 4 & 5 on the SP5055 to the existing PIC.) **DON'T REMOVE THE EXISTING PIC CHIP.** It's needed to continue doing other things. In many models, the existing PIC is used to provide the reference oscillator for the SP5055, We need it to continue doing stuff like that.

Finding a 'safe' way to cut the path between the PIC and pins 4 & 5 on the SP5055 is probably the most difficult part of the modification. With that in mind, I've included some methods that have produced good results. You may want to try one, or use your own method.



Starting from the left, the picture shows the DIP switch and PIC on the "PIC chip add-on board" installed in a converted Wavecom Pro receiver. (RF shielding cover removed.) The SP5055 is the 16 pin chip inside the RF enclosure, with wires soldered on pins 4 & 5.

Cont. on Page 18



Here is the list: (choose one)

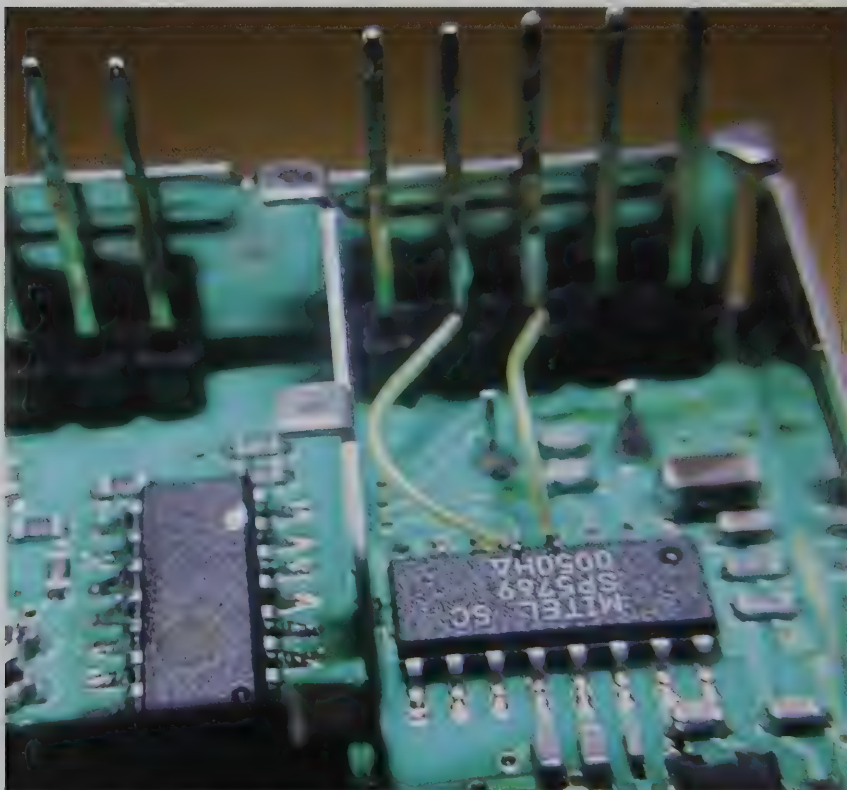
1. Remove the low value surface mount resistors occasionally used for some models (330 ohm) in the lines between the PIC and the SP5055.
2. Cut the traces on the board.
3. Cut the two pins on the PIC. (Whichever pins that you find connect to pins 4 & 5 on the SP5055.)
4. Carefully unsolder pins 4 & 5 of the SP5055 from the circuit board.

If you need to cut the traces, I've found that a small carbide drill in Dremel type drill press give me more control than trying to cut with something like an Exacto knife. I use a drill that is just slightly larger in diameter than the width of the traces. I then drill through the trace, BUT NOT THROUGH THE BOARD, to 'cut' the trace.

If you only have access to the SP5055 – You will need to unsolder and 'lift' pins 4 & 5 away from the circuit board. I've tried a number of methods, over the years. The one I'm showing, works best for me.

You start by stripping #30 silver plated wire-wrap wire and 'threading' it under the pins that you want to 'lift'. Using this method, you don't 'lift' the wire. Rather, you grasp the ends with a pair of forceps and while you are heating both of the pins with the tip of your soldering iron you gently pull the wire parallel to the surface of the board, to allow the loop of wire to slip out from underneath the unsoldered pins. This lifts the pins and wipes the solder away from the pad where the pins were originally soldered. It leaves the pins separated and slightly elevated away from the board. At this point you can VERY GENTLY adjust the unsoldered pins to make sure they are away from other contact points. DON'T try to bend them way up away from the board. Doing so will likely break them off! Bend the pins just far enough to clear the board. An alternate way is to use a small tool such as a dental pick to gently pry the pins while heating them with a very small soldering iron tip. This generally works, but MAY break the pins. If at all possible use one of the other methods that leaves the pins connected to the pc board.

After you have the existing PIC disconnected, you need to solder the wires from the add-on PIC to pins 4 & 5 of the SP5055. Using a very small tip on your soldering iron, lightly pre-tin pins 4 & 5. Remove about .02" of insulation on the #30 wire-wrap wire and lightly pre-tin. You will be making connections to rather small and delicate parts. I've found that #30 wire-wrap wire works best for this. Wire-wrap wire is usually silver plated, so is very easy to solder. It usually has a Kynar type of insulation, that is less likely to melt or shrink back from the connection. Solder the wires to the pins. With the wires positioned over the top of the SP5055 apply a small blob of hot-melt to glue the wires to the top of the IC to act as a 'strain relief'. Route the wires that you've connected to the SP5055 thru the RF shield. You should find a small



notch in the side of the RF shield that will allow the wires to pass without damaging the insulation when you put the cover back on the RF shield enclosure. Keep them as short as possible. Use a small amount of hot-melt glue to protect the wires as they come through the shield. Connect wires for ground, regulated +5 volts, SDA and SCL to the add-on board. At +5 volts, the Add-on PIC LCD display type board uses an average of less than 5 ma. The DIP switch PIC Board uses even less. So power for the boards can be provided by the 'sender'. Some 'senders' have regulated +5 volts available. Provision for a Zener diode and resistor are included on the PIC Add-on Boards for those 'senders' that use other voltages, or where access to a +5v connection is not available. In the example picture on page 17 you will see a red wire soldered to the regulated +5v lead on the 7805 regulator, and the black ground lead soldered to the grounded RF shield enclosure.

Some final random thoughts and general notes:

(1) There seems to be a general consensus that the 2.4 GHz WaveCom Jr. 'senders' transmitters produce a better looking signal than most other WaveCom 'sender' models. However there are many versions of the circuits, even for the same models, so this is somewhat variable.

(2) Assembled and tested Frequency Control PIC Add-on Board Kits are available, starting at \$15.00 for the DIP switch version and \$33.00 for the LCD read-out version, as of this writing. (This includes the assembled board and a pre-programmed PIC chip.) I also sell just pre-programmed PIC chips starting at \$8.00 each. I offer discounts for club, and large orders. If you are interested, send me an email.

W6KGE@yahoo.com

(3) Since so many different brands and models of 'senders' are now on the market, I'm interested in getting feedback and information add to my list of units that can be controlled with the 'Add-on boards'. Send me an email if you have a unit that you would like to convert.

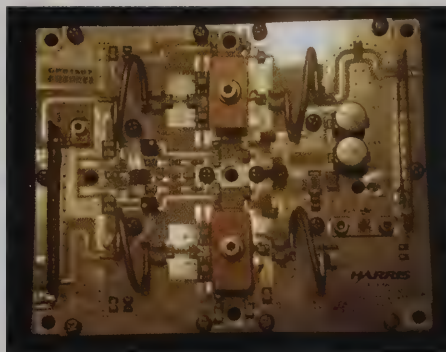
(4) The PIC's for Add-on boards are available with custom programming for various frequencies and frequency tuning 'steps'. Additionally, things like the "900/1200 MHz ATV Transmitter Demo Board (00-0044)", sold by Harlan Technologies can be tuned to 1.13 GHz. The output can then be tripled to 3.4 GHz, for use in that band. Send me an email if you are interested.

(5) The SP5055 is capable of steps as small as 0.125 MHz, (125kHz) using the 4.00 MHz reference crystal that is used in most of the 'senders'. This allows a broad range of frequencies and steps to be programmed into the PIC.

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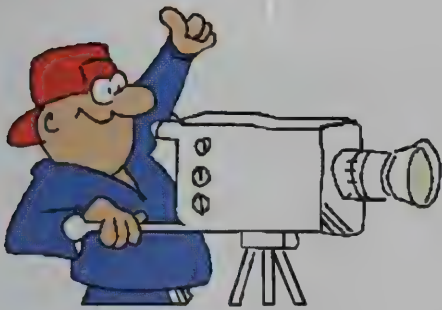
Two Digital ATV presentations from the 2009 ARRL/TAPR Digital Comm. Conference are now on DVD from ARVN. Also, WB8ELK talks ballooning, and 12 more high-tech seminars on the six-DVD set. Free preview on our web site!



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Volume II is sold out in the paper version, but available on CD.

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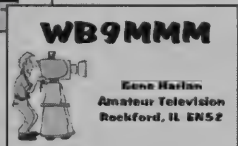
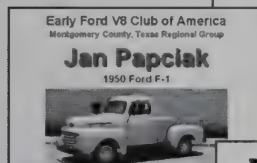
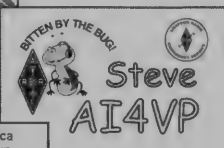
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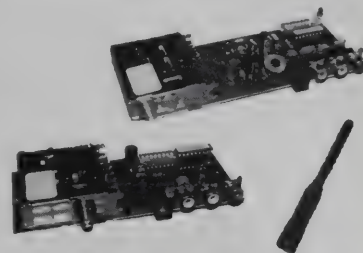
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


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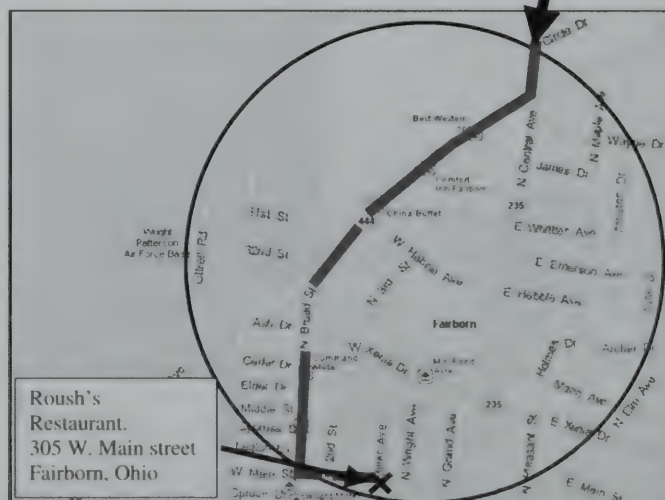
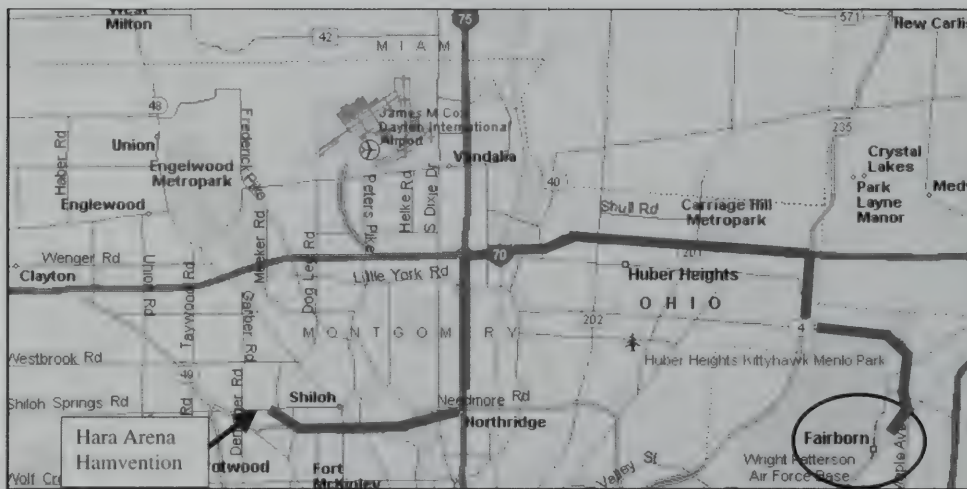
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HAMVENTION FRIDAY NIGHT DINNER SCHEDULE

The ATV Friday night dinner and discussion will be held on Hamvention Friday from 7 till 10PM at Roush's Restaurant 305 W Main St. in Fairborn, OH 45324 (at the north end of Wright Patterson airfield runway). The dinner menu is varied, moderately priced and ordered separately. We will enjoy a sit down dinner, speakers talk about various ATV topics and door prizes for those present. All present and future ATVers are welcome to join us.

Directions: Take I-75 north then I-70 east. Exit SR 235/ SR4 south (Fairborn exit). South on 235 about 1 mile then left on Chambersburg Road (east & still SR235 past airport runway). Right on N. Broad Street for about 10 blocks. Turn left on W. Main Street for 3 blocks to Miller Ave. Roush's is on corner of W. Main and Miller. Parking in rear. Roush's Restaurant. 305 W. Main street, Fairborn, OH 1-937-878-3611
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DAYTON HAMVENTION ATV FORUM TENTATIVE SCHEDULE

The ATV forum at Dayton this year will focus on Digital ATV. It will be held on Saturday May 19 at 3:30-5:00PM in room 2 in Hara Arena. It's the last forum of the day on Saturday so it will be convenient to attend and, if for no other reason, rest your feet before heading home. Please join us if you can. The preliminary presenter list follows.

SPEAKER	CALL	PRESENTATION TOPIC
Art Towslee	WA8RMC	Introduction.
Gordon West	WB6NOA	ATV antics
Mike Collis	WA6SVT	QAM modulation performance review
Lou McFadin	W5DID	DATV Space Station project details.
Ken Konechy	W6HHC(*)	DATVexpress DATV transmitter details.(demo by WA8RMC)
DATV Forum	-----(*)	DigiLite DATV transmitter details. (demo by WB8LGA)
Bill Brown	WB8ELK	ATVQ Magazine summary.

*Note: Presentation via recorded DVD.

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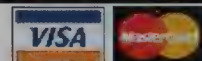
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70 CM ATV LINEAR AMP Using the RA30H4047M

This PA5 is built around the Mitsubishi RA30H4047M MOSFET RF power module. The input and output is 50 Ohms and takes just a few milliwatts of drive to get over 25 Watts output. The PC Electronics TXA5-70 series of ATV exciters, Videolynx 434 or Z70A modules, or analog cable TV modulators that output +55 to +60 dBmV and other exciters may be used as long as their output power does not exceed 100 milliwatts pep - exceeding 100 mw can blow the RA30H4047M power module. The power module has excellent modulation linearity, bandwidth and low IM for ATV up to 25 Watts p.e.p. RF output and 40Wpew with a modulator that has adjustable sync stretching. LSB regrowth at 30W was -37dBc when driven by a VSB modulator (>-50dBc lower sound subcarrier, upper set at -18dBc). The RA30H4047M power module is available from RF Parts and a PA5 board from us - specify the power module part number at time of board order.

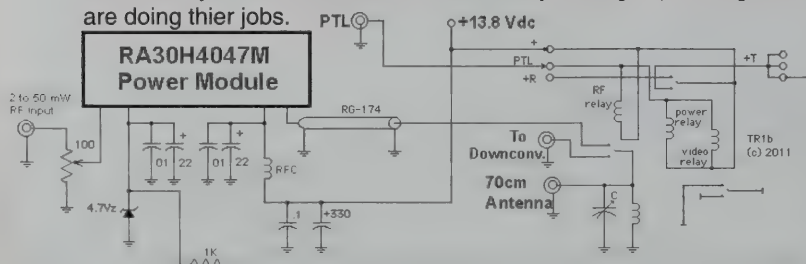
Power supply requirements are a regulated 13.8 Vdc at 6 Amps. For mobile or portable use, a standard 12 Volt car battery may be used, however the output power will vary with the actual voltage between 12 and 14 Vdc. An in-line fuse of 6 Amps must be used to prevent transients or alternator spikes exceeding 16 volts or accidental reverse polarity connection from blowing the module. Take care when connecting and using the module as the manufacturer does not warranty the device once it has been soldered in. The modules are quite hardy, however, if you get no output, check the TXA5-70 output test point, coax interconnections, etc. first. Insert a good UHF 50 Ohm attenuator if driven from a higher power exciter, and verify that the output does not exceed 100 mW before connection to the amplifier input. If the power supply leads are over a few feet long, a 4700 mF 25V cap may have to be added in the power supply line in the mobile installation to prevent line impedance ripple. Use #18 or larger hook up wire.

The RA30H4047M is not a direct physical replacement for the SAU4, MHW 710-2, BGY41B or M57716 used in the older PA5 modules or in our TC70 transceivers and TX70 transmitters, although the mounting holes are the same distance, the pin outs and bias voltages are different. The RA30H4047M and board must be mounted in an aluminum chassis for proper heat sinking and shielding. Mount the RA30H4047M low on the chassis for best heat convection upward. Spread a thin layer of heat sink compound on the bottom of the module and mating surface of the chassis. Make sure the chassis surface is clean and flat under the module. The TR-1b T/R relay board can also be mounted inside the chassis.

Running this level of power for more than a few minutes requires getting rid of the heat generated with a good heatsink, keeping all objects at least 2 inches away and a fan for air flow. Heat sinks and fans are available from places like Mouser, Marlin P. Jones, Jameco, MCM Electronics or Radio Shack and can be mounted on top of the amplifier aluminum chassis by drilling and tapping the same pattern as the the power module and PA5 board.

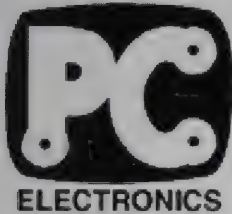
SET UP: ATV is a complex AM modulation, therefore the video swing must be set for the linear portion of the Amplifier input/output curve. To do this, the blanking pedestal (blackier than black) is set to between 50 to 60% of the sync tip power. The sync tip power is the peak envelope power of the system (p.e.p.) and like the blanking pedestal, must be constant as set in the video modulator no matter what contrast is in the picture. Therefore every video transmitter must go thru this setup to insure stable video pictures. If you add another Amplifier later or applied voltage is changed .5 V, the same set up is done with the RF power meter always in the antenna line.

1. Connect RF output into a 50 Ohm dummy load or antenna with a VSWR less than 1.5 :1.
2. Connect a RF power meter (such as aDiamond SX-1000 RF power meter or Bird with 25E slug) in the antenna line.
3. Make sure that no video source is plugged in and set the amp input 100 Ohm pot to minimum (CCW). Turn on the amplifier 13.8 Vdc regulated supply. With the Videolynx 434, Z70A or cable modulator, momentarily key on transmitter, and slowly turn the input pot to no more than 16 Watts output - current draw will be about 3.8 Amps. This will give about 25Wpew on the sync tip with video connected. If using a TXA5-70 exciter, set the pedestal to maximum and RF out pot to mid-way. Increase the amp input pot to 25 Watts, then the pedestal pot back down to 16 Watts.
4. Now you can plug in the video. While the power reading will now show lower than 16 Watts, this is average power and your actual peak envelope power will be around 25 Watts. Let it run for 5 minutes. The heat sink should not get so hot that you cannot stand to touch it with your finger (135 degrees F) to make sure the chassis, heatsink and fan are doing thier jobs.



The amplifier can be keyed up by grounding the PTL line. This will apply +13.8V to the 1K bias resistor through a relay. The TR-1b board is optional but is a good way to switch the antenna between the downconverter and amplifier.

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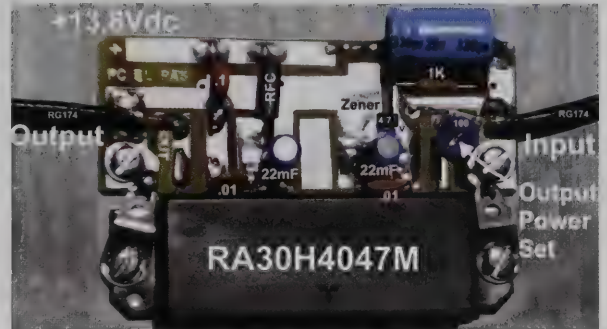
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PA5 RA30H4047M Amplifier cont.

The RA30H4047M RF power module is available from www.rfparts.com phone 800-737-2787. The PA5 board is available from us - specify it is for the RA30H4047M. Mount the board first and solder the +13.8Vdc #18 wire and connect the RG174 input and output coax to the chassis jacks and/or TR-1b board. Before mounting the power module to the chassis or heat sink, clip the leads to .25". Double check the mounting surfaces for flatness and thin layer of silicon heat sink compound. Just snug the first screw, then snug the second screw for the power module. Go back and forth tightening a little at a time to put near equal pressure on the substrate. Solder the RA30H4047M pins to the board and also the two solderlugs.



Solder the braid of the RG174 directly to the top of the shell of the chassis jack connector you choose. Cut the outer insulation back .25" from the end. Fold back the shield braid over the outer insulation and twist. Strip the inner insulation .125" back. Pre-tin the center wire and braid quickly and carefully with no bend in the coax to prevent melting through. Check with an Ohm meter. pre-tin the chassis jack then solder on the coax. Check again with an Ohm meter.

If you wish to drive this brick amp with a transmitter that is capable of more than 100mW, use a good known value series coax attenuator at this frequency and capable of dissipating the power at the input. For example, if driving from our TXA5-RC or KPA5 1W transmitters or Videolynx VM-70X set to 1W, use a Mini-circuits Lab UNAT-15+ (N conn) 15 dB 1W attenuator. Always start with the power set pot at minimum (CCW) and slowly increase while monitoring a RF power meter. Keep the input and output coax leads routed away from each other as this brick has a lot of gain and enough RF leakage radiation from the output could couple to the input and cause the amplifier to go into fatal oscillation. Use a separate regulated DC power supply capable of up to 6 Amps from the driver, and short #18 wire for best linearity.

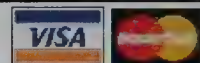
The 100 Ohm output power set pot will handle inputs from 1 to 100 mWpep. For 20Wpep output at 434 MHz full CW on the power set pot took +2 dBm or less than 2mW. The power module does have a frequency curve - reference 20W at 434 MHz, with same drive, 25W at 426.25 and 15W at 439.25 MHz. At full CCW on the power set pot, 50 mWpep input will still put out a few Watts due to the inductance of the pot leads - therefore, do not be tempted to replace this pot with a panel mounted one. Power gain increases with heat, so always run the fan over the heat sink in transmit.



At 20Wpep, the sync compression is about 2 IRE, but at 25W pep as shown on the Waveform Monitor above left, the sync compression increases to 10 IRE. At this level, some TV's may start to loose sync lock. So those driving this amp with a cable modulator or Videolynx transmitters should keep the peak envelope power below 25 watts, and preferably set for 20Wpep. The Waveform Monitor at right is running at 30Wpep with the sync stretcher in the PC Electronics TXA5-70s exciter adjusted to compensate for the sync compression. The brick was also driven as high as 40W with the sync stretched, but backed down to allow some headroom for the sound subcarrier.



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Driving the PA5 Brick Amplifiers from the Videolynx 434 or Z70A Mini ATV Transmitters

The Videolynx 434 and Z70A Mini ATV transmitters are great for short range applications up to 1/2 mile dipole to dipole or ground plane to ground plane. But there may be times that you need to extend the range but cant use higher gain antennas and need a linear amplifier. Also, if you do not have a higher power ATV transmitter for the home station, and want to get some additional use out of your Videolynx, then you can add an amplifier. See the example in the photo to the right.

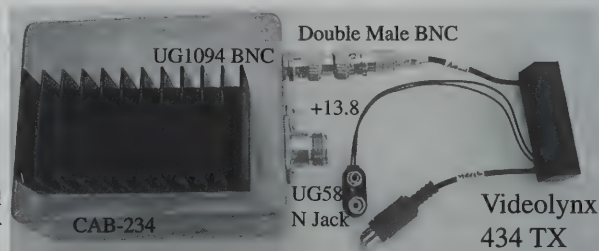
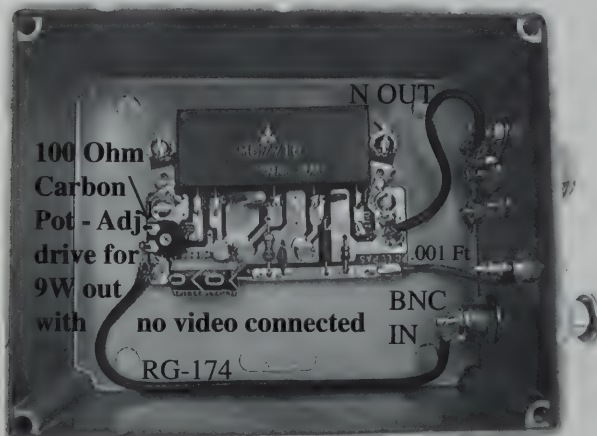
Most power modules used in the PA5 only take about 20 mw pep to give the full power output with 13.8 Vdc applied. The drive power must never exceed the input linear limit otherwise the top of the modulated waveform with flatten out and splatter the band just the same as you might be familiar with when running SSB voice.

Generally, linear amplifiers will list the 1 dB compression point and is a good reference to set the peak sync at for ATV. This is the power where the straight line input vs output departs from the actual gain line and bends over toward less gain by 1 dB as the output power increases. The RA30H4047M power module has a 1 dB compression point at about 25 watts output. This peak sync maximum corresponds to a reading on a Bird Wattmeter of about 16 Watts with dirve adjusted and no video plugged in to the Videolynx 434 or Z70A transmitter.

Since the Videolynx transmitters do not have a peak power output pot, video gain pot, or blanking pedestal (sync stretcher) pot like the TXA5-70 transmitter boards that were designed to drive this amplifier, you must reduce the peak power low enough so that the sync and color burst do not get compressed so far that the TV set will not lock up the sync and/or produce color. Over driving a linear amplifier will also clip the 4.5 MHz sound riding on the video waveform with the Z70A at each sync tip resulting in sync buzz in the received audio.

The amount of attenuation to put between the Videolynx transmitter and the amplifier input will vary from unit to unit. So on the surface, the easiest way to impliment the added amplifier is to add a 100 Ohm carbon pot. However, leads that are outside the coax are very significant inductors on the 70cm band. So one cannot use a panel pot like the video gain pot but must use a small carbon trimpot and make sure the connections are very short. Besides affecting the actual attenuation, the leads outside of the coax can radiate and get into other parts of the circuit.

The example below shows the PA5 module packaged in a CAB234 die cast aluminum box which serves to both shield the circuit and dissipate heat. Note that the placement of the power module must be on a very flat surface and so is off set to one side to avoid a raised manufacturers logo in the middle of the box. RG174 50 Ohm coax is used between the connectors and the board with short direct connections. On the BNC, fold back the shield and solder directly to the end of the shell - no pigtail.. A solder lug is used under one of the N Jacks holes and pointed toward the center socket - coax center goes through a lug hole and the braid soldered to it. The TR-1b T/R relay board could be mounted on the N Jack if you wanted to switch the Antenna between the amp in transmit and the downconverter as well as DC power switching. Bend the 100 Ohm pot CW lead 180 degrees to keep it isolated from ground and solder the coax center conductor to it. The wiper solders to the PA5 IN pad and the CCW lead to the ground plane - bend leads 90 degrees.

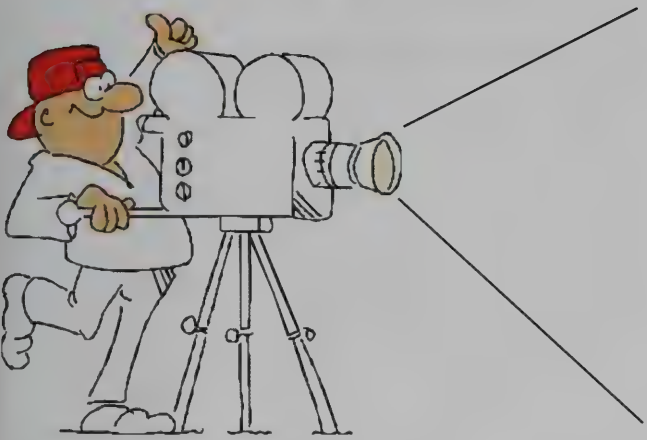


The 13.8 Vdc is fed in through a .001 mF feed through cap. The Videolynx BNC antenna jack can be connected to the amp with a double male BNC adaptor. To get rid of the heat, the amp should have nothing around it for at least 2", and a fan blowing air over the heatsink fins if transmit time will exceed 5 minutes.

PARTS LIST

- PA5 board - P. C. Electronics
- Hammond 1590C or 1590DDie Cast Aluminum box - Mouser Electronics
- UG-58 Type N Jack - P. C. Electronics
- .001 mF Feed Through Capacitor - P. C. Electronics
- TR-1b T/R Relay Board - P. C. Electronics
- UG-1094 BNC Jack - Mouser Electronics

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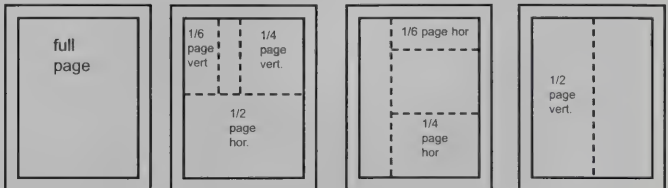
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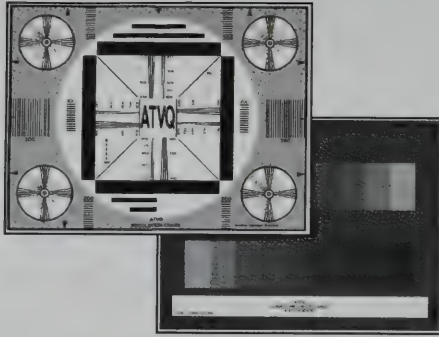


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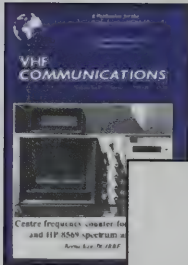
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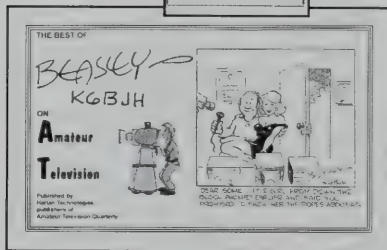
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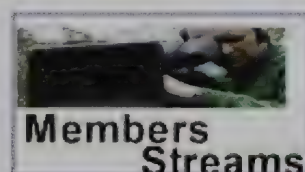
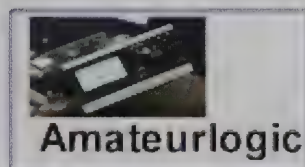
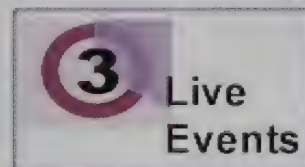
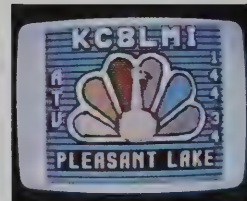
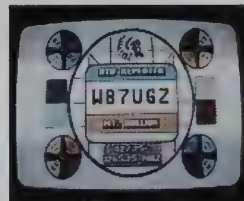
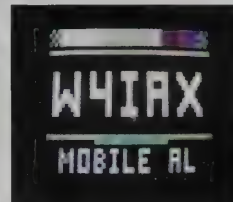
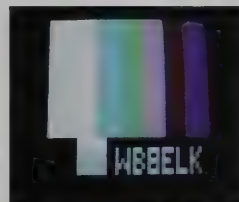
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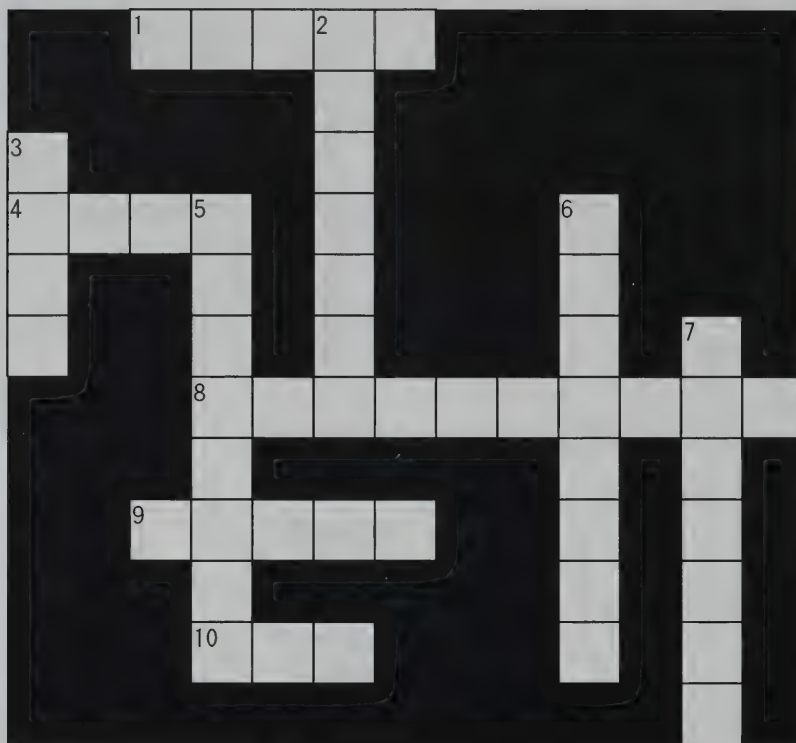
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Across

- 1 Inside vendors sit in this
- 4 Name of the Hamvention building
- 8 Lots and lots of old stuff for sale
- 9 Where all the big prizes are handed out
- 10 What the parking lots are made out of after the usual rains

Down

- 2 Last name of the ATV Forum moderator
- 3 The O in ATCO
- 5 Where you go to see talks about ATV
- 6 City where the Friday Night ATV dinner is held
<hint: see p. 24>
- 7 The N in ATN

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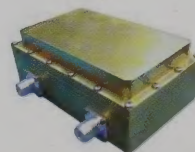
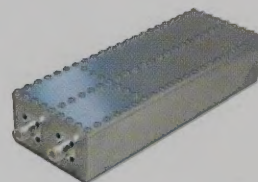
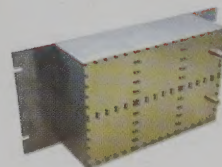
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